

## ABSTRACT OF THE DISCLOSURE

Methods and systems for modifying at least one synapse of a physical neural network. A physical neural network implemented as an adaptive neural  
5 network can be provided, which includes one or more neurons and one or more synapses thereof, wherein the neurons and synapses are formed from a plurality of nanoparticles disposed within a dielectric solution in association with one or more pre-synaptic electrodes and one or more post-synaptic electrodes and an applied electric field. At least one pulse can be generated from one or more of  
10 the neurons to one or more of the pre-synaptic electrodes of a succeeding neuron and one or more post-synaptic electrodes of one or more of the neurons of the physical neural network, thereby strengthening at least one nanoparticle of a plurality of nanoparticles disposed within the dielectric solution and at least one synapse thereof.